PROJECT CHARGE: 1702

PROJECT TITLE: FILTRATION PHYSICS

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A study has been completed on the effects of basic design parameters of CA tow filters on their porosities, pressure drops, and filtration efficiencies. It has been found that each of these filter characteristics can be predicted from the geometry of the filter and the denier of the tow. The effects of condensation on filtration efficiency are also being studied. For unventilated filters, it has been found that the contribution of condensation increases the measured efficiency exponentially as the distance between the coal and the filter decreases. The role of filter ventilation on this process is now under study. A protocol has been developed for characterizing novel filters. This involves determining the filtration efficiency per unit pressure drop of the material, as well as its pressure drop-flow behavior over the flow range of 0 to 2000 cc/min. Additionally, photomicrographs of the filter materials are made in order to determine their size and shape factors. This analysis shows that, at the same pressure drop, the trend in TPM efficiencies for a variety of filter materials is:

VAT > CONVENTIONAL CA TOW = FOAM CA > POLYPROPYLENE TOW >> COD

This observations suggests that the COD filter would make an excellent candidate for a high RTD-low efficiency filter (1,2).

Cigarettes with two different filter designs were submitted to the Flavor Development Panel for comparative evaluation. Both samples delivered 5 mg of TPM at RTD's of 4.1 in (H_2O) and ventilation levels of 51%. One sample was comprised of a 20mm section of 2.1/60K tow with a 10mm polyethylene recess at the mouth end. The vents in this filter were located at the recess-filter junction. The second sample had a 30mm filter of 2.5/32K tow with the vents located 15mm from the mouth end. Both filters were attached to MUL rods. The Panel found the recessed filter to give a harsher, hotter smoke with a plastic off-taste. The Panel also smoked the 2.5/32K filters paired with production MUL's. They found the 2.5/32K version to give "increased impact and response, increased smoke volume, hotter, drier, and a response similar to Marlboro." These filters are being applied to Cambridge to see if these flavor notes persist at this lower delivery level (3).

The Multiple Wavelength Light Extinction Photometer (MWLEP) has been refined. The photodetectors were calibrated and found linear over the extinction region of interest, and the cell system was redesigned. A prototype instrument is being designed which can incorporate more detectors than

the four used on our current model (4).

Calibrations of the MWLEP and cascade impactors are continuing. Monodisperse aerosols of DBP have been produced over the range of 0.26 to 0.61μm. The agreement between the MWLEP and the Light Scattering Photometer aerosol size measurements is good. Additional runs at larger particle sizes are being made (5,6).

Work has continued on the calculation of aerosol coagulation coefficients. Some unexpected results have been obtained. These data are being analyzed to determine whether they are real anomalies or a consequence of the numerical scheme used to generate them (6).

An evaluation of the literature on the physical properties of sidestream smoke has been completed, and a seminar on this topic was given. A report is being prepared (7,8).

REFERENCES

1) S. G. Abel
2) R. W. Dwyer
3) M. L. Fleming
4) R. M. Creamer
5) D. M. Puzio
6) K. A. Cox
7) D. D. McRae
8) D. D. McRae: "The Physical Properties of Side Stream Smoke," presented at the P.M. Side Stream Symposium, August 27, 1981.

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